



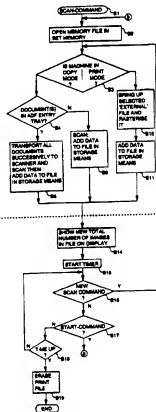
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification<sup>6</sup>:</b> <b>G06F 3/12</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 96/18142</b> <b>(43) International Publication Date:</b> 13 June 1996 (13.06.96)
<b>(21) International Application Number:</b> PCT/NL95/00407 <b>(22) International Filing Date:</b> 30 November 1995 (30.11.95) <b>(30) Priority Data:</b> 9402088 9 December 1994 (09.12.94) NL <b>(71) Applicant (for all designated States except US):</b> Océ-NEDERLAND B.V. [NL/NL]; P.O. Box 101, NL-5900 MA Venlo (NL). <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> VAN VLIEMBERGEN, Eduardus, Josephus, Willibrordus [NL/NL]; La Fontainesstraat 7, NL-5924 AX Venlo (NL); DEEN, Jurek, Nikola [NL/NL]; Ariënswei 34, NL-5912 JA Venlo (NL); COL-LARD, René, François, Albert [NL/NL]; Condorstraat 2, NL-6591 TT Genneep (NL). <b>(74) Agent:</b> HANNEMAN, Henri, W.; Océ-Nederland B.V., Patents and Information, P.O. Box 101, NL-5900 MA Venlo (NL).		<b>(81) Designated States:</b> JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). <b>Published</b> <i>With international search report.</i> <i>In English translation (filed in Dutch).</i>

(54) Title: ASSEMBLY OF A SET OF IMAGES IN A DIGITAL COPYING/PRINTING MACHINE

## (57) Abstract

A digital copying/printing machine by means of which a set of images can be assembled from document images input in separate actions. This set can then be printed as a whole. Document images can be input by means of a scanner (physical documents) or via a connection to a digital environment, such as a network (digital document images). For digital document images a storage unit is provided in which different images can be stored and which is provided with a selection function for selecting the required image for inclusion in the set. A separate input key is provided on the operating panel for starting inputting actions. Individual adjustments for the printed product can be made for each input action, e.g. for lighter or darker or single or double-sided printing. An image thus input is included in a set file in the memory of the machine. In response to actuation of a print key on the operating panel the entire set file is printed.



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

**Assembly of a set of images in a digital copying/printing machine**

5           The invention relates to a system for assembling a set of images and reproducing the same on image supports, such as sheets of paper, comprising generating means, including an electro-optical scanner, for generating digital image data corresponding to an image; a storage unit for temporary storage of image data generated by the generating means; a printing unit for printing on image supports  
10       images corresponding to image data in the storage unit; an operating unit provided with operating means operable by an operator; a control unit connected to the generating means, the storage unit, the printing unit and the operating unit, said control unit being adapted so to control the generating means and the storage unit in response to a command given for the purpose from the operating unit, that digital  
15       data generated by the generating means are each time stored in or added to a set file in such manner that image data generated in separate actions by the generating means are assembled in the storage unit to form the said set file; and to cause the said set file to be completely printed by the printing unit in response to a command given for the purpose from the operating unit.

20           The invention also relates to a method of assembling and printing a set of images as applied in the said system.

          A system and method of this kind are known from US patent number 5 301 262. In the known system, a set of images can be assembled from document images generated by means of a scanner in separate actions and be printed after  
25       assembly. For this purpose, a non-print mode is first set by means of a key on the operating panel, whereafter the digital image data of scanned documents are not printed directly, but are simply stored in a memory. In these conditions documents can be fed to the scanner by means of an automatic feed unit or be manually placed on the glass platen forming part of the scanner. The starting key on the operating  
30       panel has to be actuated to start the scan action for each document or stack of documents (in the case of an automatic feed unit). The set of images thus built up can be printed by leaving the non-print mode and actuating the start key.

          If the non-print mode has not been set, the said start key has the function of starting a complete copying cycle, comprising scanning and printing. Its function is  
35       thus changed by setting the non-print mode.

          The known system offers the possibility of assembling documents of different types to form a set. These documents must all be physical documents, because they must be scanned by the scanner. Developments in information processing,

however, mean that documents are increasingly available only in digital form. If these "documents" are also to be added to the set, a print of the digital information must first be made so that this print can be scanned by the scanner. This not only means extra work, but the consecutive actions of printing and then scanning may  
5 result in a loss of quality. It is therefore desirable to be able to add information in digital form as well to the set of images.

Other systems for assembling and printing a set of images are known from US Patents 5 081 494 and 5 299 021. The common feature of these known systems with the system described above is that they can only process physical  
10 documents.

The object of this invention is to obviate the said disadvantage of the known systems, to which end, in a system according to the preamble, the generating means also comprise an inputting unit for receiving data fed from a digital environment and corresponding to images, and generating digital image data  
15 corresponding thereto. Consequently, the control unit can also add to the said set file a digital image data file supplied via the said inputting unit. The term "digital environment" is intended to denote a local network to which one or more workstations are connected, a directly connected workstation, a read-out station for a digital storage medium, such as a floppy disk drive, and so on.

20 In one attractive embodiment, the said inputting unit stores in a memory a digital image data file supplied from a digital environment and a selection function is provided for selecting a data file stored in the memory and supplied from a digital environment for the purpose of adding the same to the said set file in the storage unit.

25 In this way it is possible to send various files to the system, and a choice can be made from these as required.

In the known systems, the mode in which a set of images is assembled is generally initiated by actuating a key and printing of the set is possible only after the said mode has been left, again by actuation of a key. In the collection mode, the  
30 machine starting key, which normally results in a complete copying cycle, has the function of adding an image to the set. A change of function of this kind may be confusing to an inexperienced user.

To obviate this, in the system according to the invention, a separate key is provided on the operating panel, which key is at all times reserved for the creation  
35 of a set file and for the addition of a digital image data file to said set file or, if a set file has already been created, the addition of a digital image data file to said set file.

In another embodiment, the said key is operative both for data files generated by the scanner and for data files supplied from a digital environment. Consequently,

all the actions for adding an image to the set are started with the same operating element. This is an advantage in respect of consistency of the machine behaviour and hence ease of operation.

In a further embodiment, the images added to the set are also immediately  
5 printed once. The advantage of this is that if only one print was required it is ready immediately after assembly of the set and there is therefore no longer any need to await printing.

The invention will now be explained with reference to the accompanying drawings in which like references relate to like parts.

10 Fig. 1 is a diagram of the general layout of the system according to the invention.

Fig. 2 shows the scanner system with an automatic document feeder.

Fig. 3 is a block diagram of a processing module for digital image data.

Fig. 4 shows two histograms of grey values.

Figs. 5A, B and C show an OD correction characteristic.

15 Fig. 6 is a diagram showing a unit for supplying digital image data from an external source.

Figs. 7 and 8 show the operating panel of the system according to the invention.

Fig. 9 is a flow diagram of the process for the assembly of a set of images and

Fig. 10 is a diagram of the printing process for a set of images.

20 Fig. 1 shows the general layout of an image reproduction system according to the invention. The system comprises a scanner 1 for electro-optical scanning of a document and for delivering digital image data corresponding thereto, an automatic document feeder unit 1A, a processing unit 17 for image data supplied by the

scanner 1, a supply means 2 for image data from an external source, such as a

25 network, and a printing unit 3 for printing digital image data on a support material.

The system also comprises a storage means 15 for image data, connected to the processing unit 17, the supply means 2 and the printer 3 and operative as a buffer between the parts 1 and 2 which generate the print data and the part 3 of the

system, which processes the print data, and also an operating unit 19 provided with an operating panel with a display and keys, connected to the processing unit 17.

30 Finally there is a central control unit 18 connected to all the other elements.

The scanner 2 is shown in greater detail in Fig. 2. It is provided with a tubular lamp 5 and a reflector 6 co-operating therewith, by means of which a narrow strip of a document 8 placed on a glass platen 7 is illuminated. The scanner also  
35 comprises an array 10 of imaging glass platen fibres (a "selfoc lens array") whereby the light reflected by the document is projected on to a sensor array e.g. a CCD array 12. The lamp 5, reflector 6, selfoc lens array 10 and CCD array 12 are combined on a carriage 11 which, during the scanning operation, is advanced at a

uniform speed in the direction of arrow 13 by a servomotor 9 so that the document 8 is scanned line by line by the CCD array 12. The position of the carriage 11 is continuously measured with means known per se and is used inter alia for the feedback circuit of the servomotor 9.

5 In this way, each image dot of the document is converted into an analogue signal which corresponds to the grey value of that dot. The analogue signal is then converted to a digital signal for each image dot by an A/D converter 14.

The scanner is provided with an automatic document feeder (ADF) 1A. This comprises an entry tray 301 for documents 302, into which they should be placed  
10 with the front facing down. The unit 1A also comprises a first transport path 303, a second transport path 304, 305 and a third transport path 306, and also a conveyor belt 307 situated opposite the glass platen 7, and a delivery tray 308. The said transport paths are formed by guide plates and driven pairs of rollers 309, 310, 311 and 312. A separating belt 313 co-operates with a separating roller 314 to remove  
15 the documents 302 one by one from the bottom of the stack and for feeding a separated document to the first transport path 303.

The connection between the first transport path 303 and the second transport path 304 is such that documents are fed automatically from the first transport path 303 to the second transport path 304 but are fed from the second transport path 304  
20 to the third transport path 306 with a reverse movement.

A one-sided document is fed from the first transport path 303 to the second 304 until it has completely left the first transport path 303. The direction of transport is then reversed and the document is fed via the third transport path 306 to the transport path 307 which positions it on the glass platen. On completion of the  
25 scanning operation it is then fed to the delivery tray 308.

A double-sided document is first fed by the first (303) and second (304, 305) transport paths to the glass platen 7, where the back is scanned, and is then returned and again fed via the transport paths 305, 304 and 306 in the inverted position to the glass platen 7. After the front of the document has been scanned it  
30 is delivered in the delivery tray 308. As a result of this procedure, the scanner scans the front and back of the document in the wrong sequence, but this is subsequently corrected on storage of the image data in the storage means 15, by adapting the storage means management system.

Fig. 3 is a block diagram of the processing module 17 for converting digital  
35 signals from the scanner to binary image data suitable for controlling the printer. The module comprises a histogram module 100 provided with an input for signals from the scanner 1, an analysis module 101 connected to the histogram module 100, an OD correction module 102 connected to the analysis module 101 and to the

operating unit 19, and also having an input for signals from the scanner 1, and also a half-tone module 103 connected to the OD correction module 102 and to the storage means 15.

Scanning a document on the glass platen is effected in two phases. In the first or pre-scan phase, the scanning carriage 11 moves along the document 8 and in so doing delivers digitised signals corresponding to the measured optical density of a first raster of image dots of the document image. These signals are used to characterise the type of document, so that an appropriate processing of the scanner data can be selected. In the second or main scanning phase, the scanning carriage 11 moves along the document 8 in the reverse direction and again delivers digitised signals which this time correspond to the measured optical density of a second raster of image dots of the document image. The first and second rasters may be identical, but the first raster may be coarser so that in that case fewer image dots are surveyed.

The scanner signals from the prescanning operation are delivered to the histogram module 100, which makes a histogram of the measured values. After completion of the prescanning operation, the results of the histogram module are passed for analysis to the analysis module 101. The latter characterises the scanned image as a text image or a photographic image. Fig. 4 shows two characteristic histograms, one for a text image and one for a photographic image. The x-axis shows the optical density (OD) and the y-axis the number of image dots (N). A text image contains two relatively narrow and tall peaks corresponding to the white of the paper and the black of the characters. Grey values therebetween are less frequent and originate mainly from image dots situated just at the edge of a character. On the other hand, the histogram of a photographic image contains many grey and fewer white and black image dots. By reference to preprogrammed criteria the analysis module now determines whether the histogram belongs to the text type (with two distinct peaks) or the photographic type (with a more continuous distribution). This decision is transmitted to the OD correction module 102.

In the latter the grey values of the digitised scanner signals from the main scan are converted to other grey values in accordance with a preselected characteristic. The module contains a number of different characteristics and selects one on the basis of the signals from the analysis module 101 and on the basis of a light/dark setting selected by the operator on the operating panel of the operating module 19.

Fig. 5A shows an example of the characteristics for a text image and a photographic image respectively in the case of light/dark setting 0. It will be apparent from this that a text image is imaged hard, i.e., light tones are made white

and dark tones black, while only a small number of middle tones are reproduced as grey. Consequently, the resulting printed image contains mainly black on white, and this is usually what is intended with a text image. On the other hand, a photographic image is reproduced much more softly. The characteristic images  
5 most of the grey tones as grey tones and only a relatively small number of grey tones at the end of the range is converted to white and black respectively.

Figs. 5B and 5C show the adjustment of the characteristics on a change of the light/dark setting by the operator. The adjustment differs with text and photographic images respectively. In the OD correction module 102 the various  
10 characteristics are stored in digital tables corresponding to the curve shown in the graphs.

The image data converted in the OD correction module 102 are then converted to binary data in the half-tone module 103 by a technique known per se. Dither technique or error diffusion technique or a mixed form thereof, for example,  
15 will be used. These techniques are described in detail in the literature and are not therefore explained further, also because the half-tone technique used is not relevant to the present invention. It should also be noted that the skilled person knows that the OD correction, which is described here as a separate processing of the scanner signals, can also be integrated in the half-tone method.

20 The binary image data are now suitable for processing by the system printer unit 3. While awaiting this they are stored in the storage means 15, in compressed form if required.

The unit 2 for supplying digital image information from an external source, or the "front-end", is shown in Fig. 6. This unit is provided with a network connection  
25 unit 220 connected to an external network 16, to which a number of workstations, for example, can be coupled. These workstations can send data files in various generally used formats (page description languages such as PCL, PostScript, etc) via network 16 for printing. The technique of networks and the sending of data files over the same is generally known and will not therefore be explained here.

30 The connection unit 220 is connected to a job recognition module 222 which is in turn connected to a hard disk 223. The job recognition module 222 determines the page description language (PDL) used for each data file supplied and extracts identification data contained therein. In network systems, transmitted data files are always provided with identification data. These data usually contain the name of the  
35 sender (owner) of the file and the name of the file itself. These data are extracted by the job recognition module 222.

The hard disk 223 intended for interim storage of a supplied data file is also connected to a PDL interpreter 224 for converting a data file coded in a page



description language into a form suitable for processing by the printer unit 3. This processing is generally known as "rasterisation". The PDL interpreter 224 is connected via a buffer 225 to the intermediate storage means 15. The job recognition module 222, hard disk 223 and PDL interpreter 224 are also each  
5 connected to the control unit 18.

In the system described here, when a data file is supplied via the network, a print is usually not made thereof immediately, a command from the operating panel being awaited.

The procedure when a print order enters via the network is as follows (see  
10 Fig. 6). A data file for printing supplied by a workstation via the network is transmitted by the network connection unit 220 to the job recognition module 222. This extracts a number of predetermined identification data from the file, examines the file to recognise the page description language (PDL) used, and transmits these identification data and PDL to control unit 18. In this example, the extracted  
15 identification data comprise the name of the owner and the name of the file itself. The file is then stored unchanged on the hard disk 223, after which the system passes into the stand-by condition.

Control unit 18 manages a list containing the identification data of all the data files for printing stored on the hard disk 223. If a new file is supplied via the  
20 network, then the control unit 18 adds the identification data thereof to the list. Whenever a data file has been printed, the control unit 18 removes the identification data of that file from the list.

If an operator now wishes to print a specific data file, he must give a command for this purpose by means of the system operating panel 19A. In  
25 response thereto, the data file is brought up from the hard disk 223 and converted by the PDL interpreter 224 into printable data which, after intermediate storage in storage means 15, are printed by the printing unit.

The system construction can also be such that data files supplied are immediately converted into printable data and then stored in the storage means 15.  
30 The list referred to above then contains the data of the supplied and converted files.

During the making of a print, binary image data of an image are fed from the storage means 15 to the printing system 3 under the control of the control unit 18.

The printing system 3 is an electrophotographic processing unit, in which a photoconductive belt is charged and exposed image-wise by means of an LED array  
35 fed with the binary image data. The remaining charge image is developed with toner powder, whereafter the image formed by the toner powder is transferred to a receiving medium, e.g. a sheet of paper, and fixed thereon. Processing modules of this kind are generally known and therefore require no further explanation.

Moreover, the invention is not restricted to the processing module described here; other printing systems, such as laser or ink jet printers, can also be successfully used in a system according to the invention.

The operating panel associated with the operating unit 19 is shown in Fig. 7 and comprises a display screen 60, e.g. an LCD display, and a number of keys, namely a start key 61, digit keys 62, a correction key 63, a storage key 67 and selection keys 64A - E, 65A - D and the star key cluster 66A - D. The latter comprises the keys 66A (up), 66B (down), 66C (to the right) and 66D (to the left). All these elements are connected to the operating unit 19 which, in response to operation of the keys, transmits signals to the control unit 18 and also controls the screen 60 to display the selection options and messages to the operator.

When the system is switched on, the screen 60 shows an image formed by a number of vertical columns each situated above one of the selection keys 64A - E. Each column relates to a specific basic function of the system and shows the various possible settings of this basic function. For example, the furthest left-hand column is allocated to the choice between copying mode, in which a document is scanned by the scanner and then reproduced, and the printer mode, in which a print is made from digital image data fed via the network connection. Whichever setting is selected at any particular time, in this case the copying mode, is indicated by a symbol, e.g. a dark dot, or by highlighting.

By actuating a selection key an operator can select a different setting, e.g. in accordance with a cyclic scheme. As a result of a change of a setting, the function of one or more of the other selection keys may change, because the old function is no longer relevant and the other selection options are what are required. Other texts applicable to the new function then appear in the associated column of the screen 60.

The selection keys 65A - D offer the possibility of calling up another set of functions (headings), which cannot be displayed owing to the limited dimensions of the screen 60. Generally, these are functions which are not required for a simple copying or printing job, but which offer the operator more options for obtaining special printing results. In this example, these functions comprise shifting the margin on the print, adding covers and multiple-up. The meaning of the keys 65A - D is indicated in an associated field on the screen 60, directly beneath each key. When one of the keys is actuated, a corresponding set of functions is activated and the make-up of the screen 60 is adapted to the associated functions. At the same time, this selection is displayed by framing or otherwise making conspicuous on the screen 60 the field belonging to the actuated key of the group 65A - D.

The columns above the keys 64A (already referred to), 65B (single-sided or

double-sided, both with respect to the original document and the copy sheet), 64C (stapling) and 64D (the choice of format of printing paper) relate to the finishing of the order.

5 The column above key 64E is intended for changing the light/dark setting by means of which the copy can be made lighter or darker. The chosen setting is transmitted to the processing module 17, more specifically the OD correction module 102, which reacts there in the manner described in connection with Fig. 5B and 5C. The relevant setting is shown graphically by an arrow head on a bar of increasingly narrow black strips. There is also a description of the relevant setting in the column, in this case "neutral". Other descriptions are "lighter" and "darker". The setting can be changed by means of the cluster keys 66C and 66D. This is displayed to the operator by showing the star symbol in the column.

The operating panel also contains a digit display 72 for showing the number of prints set, as is conventional on copying machines.

15 The function of the storage key 67 will be explained in detail hereinafter.

Fig. 8 shows the make-up of the screen 60 after the printing mode has been selected in the "basic settings" heading by means of key 64A. In this case the function of key 64B changes inasmuch as it is now possible only to set "single or double-sided" in respect of the print. The keys 64D and 64E also now have the function of specifying the data file for printing by selecting the user and file name. 20 Various files from different users may be stored in the memory. All these files are recorded in the list of the control unit 18, as described hereinbefore, and can be displayed on the screen 60 for selection.

After actuation of key 64D, an operator can select a user name from the list of users who have sent one or more files, and after actuating key 64E a file name can be selected from the list of files sent by the selected user.

On selection of the print mode with key 64A the system also automatically comes into the same condition as after actuation of key 64D. In that case the latter key does not have to be re-actuated.

30 In response to actuation of key 64D (or 64A) the column of the screen above this key is provided with a frame 90 and a star symbol 91 to show that a user name can be selected and that the star keys 66A - D are operative for that selection. As an automatic pre-selection, the name is selected of the user who last sent a file to the system. Alternatively, the first user name could be taken in alphabetical sequence or any other preference.

35 The pair of keys 66A/B is used for scrolling alphabetically through all the user names, forward by means of key 66A and backward by means of key 66B. If there are more names than can be displayed simultaneously in frame 90, then the display

shows as many names as fit within the frame and the whole list is scrolled through automatically. A bar 92 with text therein in reverse video shows what name has been selected.

In response to actuation of key 64E the column of the screen above this key is provided with a frame and a star symbol in the same way as the procedure on actuation of key 64D as described above, to show that a file name can be selected and that the keys 66A - D are active for that selection. The selection with the star keys is completely identical to that for selection of a user name. The last file sent, for example, is chosen as a pre-selection.

The file thus selected is printed on actuation of the start key 61.

With the system described above it is possible to assemble a set of images from a number of images input in various ways, both scanned documents and files of digital image data, and print this set as a whole. The storage key 67 on the operating panel is used for this purpose.

Actuation of storage key 67 has the same results as actuating the start key 61, except for starting the printing procedure. Thus digital data are generated and stored in the storage means 15, but the control unit 18 then passes to the stand-by mode. In this mode an operator can define a new image by placing a document in the ADF entry tray or on the glass platen or by selecting a digital data file. On actuation of the storage key 67 the control unit 18 is re-activated and the scanner 1 or front-end 2 starts up. The digital image data then generated are then added to the file already stored in the storage means 15.

If start key 61 is actuated in the stand-by condition, the control unit 18 starts the printing system 3 and causes the built-up set of images in the storage means 15 to be printed by the printing unit 3.

The functionality of assembling a set of images offers a number of extra options which are not otherwise available, such as individual processing of the image data of each original separately (e.g. making them lighter or darker), making collected copies of a set of documents which have each been placed separately on the glass platen manually, and making double-sided copies of documents manually placed on the glass platen.

Fig. 9 is a flow diagram of the process for assembling a set of images.

The process starts when the storage key 67 is first actuated after completion of a preceding printing process or a period of rest. In the drawing this is described by the term "scan command", which in this connection is also considered to refer to the rasterisation of digital image data from an external source. The operator will already have placed a first original document in the ADF entry tray or on the glass platen or selected a digital original via the operating panel, and also selected

specific settings for the printing on the operating panel.

If the operator now actuates the storage key 67 (S1), the process for assembling and printing a set of images starts for the control unit. The control unit 18 opens a new file for print data in the storage means 15 (S2), hereinafter referred to as the print file, and then checks whether the copying or printing mode has been set by the operator using key 64A (S3). In the former case the first original is a physical document while in the second case it is a digital data file. The message field on the top left of the screen 60 displays the message "image is added to print file". This field also always displays the total number of document images stored in the storage means 15.

If the copying mode is set, the control unit checks whether there is a document in the ADF entry tray (S4).

If this is the case, the control unit starts the ADF in order to bring the document or, if there is more than one document in the entry tray, all the documents in succession from the entry tray to the glass platen. Each document is scanned by the scanner 1 and the image signals from the scanner after being converted to digital signals are passed to the processing module 17, which converts them to digital image data in accordance with the settings on the operating panel, such as, for example, the above-described light/dark setting. These image data are stored in the print file in the storage means 15 (S5) together with control data for the printing unit, such as the format of the printing paper (for each print separately).

If the test in step S4 shows that there is no document in the entry tray of the ADF, it is assumed that an original has been placed on the glass platen and the ADF is not started. The scanner 1 is then moved and the original on the glass platen is scanned, whereupon the image signals are again converted to digital image data by the processing module 17 and stored in the print file in the storage means 15 (S6).

It should be noted here that the operating panel is fully operational with respect to the properties of the images to be added to the set.

If step S3 shows that the system has been set to the mode for printing files of digital image data from an external source, the control unit 18 checks what file has been selected on the operating panel, brings the selected file from the hard disk 223 of the front-end 2 and rasterises it (S10). It is then stored in the storage means 15 in the print file together with any printing settings selected on the operating panel, or else, if this is not the first image, it is added thereto (S11). Just as in the copying mode, the operating panel is fully operational.

After new images have been added in the manner described hereinbefore, the total number of document images stored in the print file in the storage means 15 is

adjusted in the message field at the top left of the screen 60 (S14), and after this the system awaits a new order.

Directly after completion of step S14, a time counter is started (S15) and if no keys are actuated within a certain set time (S18), the time counter erases the print file from the storage means 15 (S19) and terminates the process. The object of this is to prevent the image data of a set remaining in the storage means and being printed during a following copying order if the operator, no matter why, does not print the assembled set of images.

In the meantime, the control unit 18 checks whether the storage key has been actuated again (S16), so that a new image or a new series of images is added to the set in accordance with the above procedure as from step S3. If the scanning key is not actuated but the start key 61 is actuated (S17), the control unit passes to the print mode, in which the assembled set of images is printed as a whole.

During the stand-by state it is possible to erase from the print file the image data of the last images input. For this purpose the operator can actuate the correction key 63 on the operating panel. In response to this the image data added on the last input action are removed again. This can affect a number of images if the last input action has involved a set of documents (from the ADF) or digital images (from the front-end). Alternatively, the removal action can be implemented in such manner that actuation of the correction key 63 always results in removal only of the image data of the very last image, possibly followed - in the event of the last input action involving a number of images - by a message on the screen to the effect that if the correction key is again actuated the entire last group of images will be erased. Of course, after removal of one or more images the total number of document images stored in the storage means 15 is adjusted on the screen.

Fig. 10 shows the flow path of the printing process following the assembly of a set of images as described above.

Before the operator actuates the start key 61 for starting the printing process, he can still set the number of prints by means of the keys 62. With regard to the finishing of the prints he can also make settings which have not already been established on assembly of the image set. Settings which can still be made are those which relate to finishing the package as a whole, such as stapling, adding covers, insertion of blank pages, etc.

When the operator then actuates the start key 61, the control unit 18 starts the system printer 3, which in turn prints the complete set of images in the set number and with the set finishing (S20). The operating panel display then displays the message: "Print ready; actuate start key for printing again or correction key for removal of image data".

Directly after completion of the printing process, a time counter is started (S21) and if no keys are actuated within a certain set time (S22), the time counter erases the print file from the storage means 15 (S23) and terminates the process.

If (S22) the start key 61 is again actuated within the said time, possibly after a  
5 new value has been set for the number of prints, the control unit 18 first checks whether there are any instructions that this start command is intended for an entirely new order. For this purpose, the control unit checks whether (S25) a new digital file supplied from an external source and stored in the front-end 2 has been selected, or whether (S26) there are documents in the ADF entry tray 301, or whether (S27) the  
10 ADF has been open since the previous start command (S17). The latter shows that a document has been placed on the glass platen 7. If none of these conditions is met, the control unit 18 starts the printing system 3 again to make the required number of prints. If one of these conditions is satisfied, then the print file is erased from the storage means 15 (S28) and the control unit finishes the apparently  
15 required new printing or copying order.

The possibility of making a print again is intended to give the operator the opportunity to check the printed set. Of course it is possible that a mistake has been made in assembling the set, for example because the sequence is incorrect. If  
the operator first wishes to check that the set is correct, he can therefore first make  
20 a print and if this is in order set the system to print the full number. Similarly, the settings applicable for printing the entire packet can also be changed then.

If the correction key 63 is actuated instead of the start key 61 during the time counter time interval (S30), the control unit 18 erases the print file from the storage means 15 (S23) and terminates the process.

25 If the storage key 67 is actuated (S30) within the time counter interval, showing that the operator wishes to start a new assembly process, the control unit 18 erases the print file from the storage means 15 (S32) and starts the new assembly order.

In this connection it should be noted that the term "printing process" should be  
30 understood here as meaning also writing the print order into a queue if orders made earlier are still awaiting completion. This has no further consequences for the procedure described in Fig. 10.

In an alternative embodiment of the system according to the invention, the procedure according to Figs. 9 and 10 deviates from the above-described procedure  
35 in that during the assembly of the set of images the image data of the added image or images are not only included in the print file but are also transmitted to the printing system 3 for directly making a print. The advantage of this embodiment is that on completion of the set assembly the first print is already made. If only one

copy was wanted that completes the order. If required, the image data can then immediately be removed from the storage means 15 by actuating the correction key 63. This print can also be used to check that the set is correct and then the making of the required number of prints can immediately start.

- 5       The invention has been described with reference to the above exemplified embodiments, but the scope of the invention is considered to be defined by the claims. It will be clear to the skilled man that many alternative constructions are possible within the scope of the claims.



**CLAIMS**

1. A system for assembling a set of images and reproducing the same on image supports, such as sheets of paper, comprising
- 5 generating means, including an electro-optical scanner, for generating digital image data corresponding to an image;  
a storage unit for temporary storage of image data generated by the generating means;  
a printing unit for printing on image supports images corresponding to image data in
- 10 the storage unit;  
an operating unit provided with operating means operable by an operator;  
a control unit connected to the generating means, the storage unit, the printing unit and the operating unit, said control unit being adapted
- so to control the generating means and the storage unit in response to a command
- 15 given for the purpose from the operating unit, that digital data generated by the generating means are each time stored in or added to a set file in such manner that image data generated in separate actions by the generating means are assembled in the storage unit to form the said set file,
- and to cause the said set file to be completely printed by the printing unit in
- 20 response to a command given for the purpose from the operating unit;  
characterised in that  
the generating means also comprise an inputting unit for receiving data fed from a digital environment and corresponding to images, and generating digital image data corresponding thereto.
- 25 2. A system according to claim 1,  
wherein the said inputting unit stores in a memory a digital image data file supplied from a digital environment and wherein a selection function is provided for selecting a data file stored in the memory and supplied from a digital environment for the purpose of adding the same to the said set file in the storage unit.
- 30 3. A system according to claim 1 or 2,  
wherein the said inputting unit comprises a connection unit for a digital network.
4. A system according to claim 1 or 2,  
wherein the said inputting unit comprises a read-out station for a storage medium, e.g. a floppy disk.
- 35 5. A system according to claim 1 or 2,  
wherein the operating means comprise a first operating means such as a key which at all times is reserved for the creation of a set file and for the addition of a digital image data file to said set file or, if a set file has already been created, the addition

of a digital image data file to said set file.

6. A system according to claim 5,  
wherein the inputting unit stores in unchanged form in the memory a digital image data file supplied from a digital environment and wherein the control unit in response  
5 to the selection of a stored file followed by operation of the said first operating means, starts a rasteriser for generating a file of printable image data corresponding to the selected file, and adds the file thus generated to the said set file.

7. A system according to claim 5,  
wherein the control unit in response to the reception by the inputting unit of a digital  
10 image file supplied from a digital environment starts a rasteriser for generating a printable image data file corresponding to the received file, and stores in the memory the file thus generated.

8. A system according to claim 5,  
wherein the said first operating means is operative both for data files generated by  
15 the scanner and for data files supplied from a digital environment.

9. A system according to claim 5,  
wherein the operating means comprise a second operating means such as a key,  
the operation of which after the first operating means has been operated at least  
once, has the result that the control unit terminates the assembly of data files and  
20 causes the set file to be printed.

10. A system according to claim 5,  
wherein the operating means comprise a third operating means such as a key, the  
operation of which after operation of the first operating means has the result that the  
control unit removes from the set file the data file which in response to the last  
25 operation of the first operating means had been added to the set file.

11. A system according to claim 1 or 8,  
wherein the operating means comprise a display screen on which the actual number  
of images corresponding to the image data in the print file in the storage means is  
reproduced.

- 30 12. A system according to claim 1 or 2,  
wherein the control unit so controls the system that on each addition of image data  
to the set file in the storage means said image data are also printed by the printing  
unit.

13. A method of assembling a set of images and reproducing the same on  
35 image supports, such as sheets of paper, comprising  
generating digitised images in separate actions by means of generating means,  
comprising at least one electro-optical scanner, and each time storing the same or  
adding the same to a set file in a memory, in such manner that the digitised images

generated in the said separate actions are assembled to a set;  
printing on image supports by means of a printing unit a series of images  
corresponding to the complete set of digitised images;  
characterised by

- 5 receiving from a digital environment digital data corresponding to images and  
converting the same to digitised images, and also adding such digitised images to  
the said set.

14. A method according to claim 13,  
characterised by

- 10 storage in a memory of a digital image data file supplied from a digital environment  
and  
offering for selection data files stored in the memory and supplied from a digital  
environment for the purpose of adding the same to the said set.

- 15 15. A method according to claim 14,  
wherein a digital image data file supplied from a digital environment is stored  
unchanged in the memory and is converted to digitised images only in response to  
its selection and an addition command following the same.

16. A method according to claim 14,  
wherein a digital image data file supplied from a digital environment is converted to  
20 digitised images and stored in that form in the memory.

17. A method according to claim 13 or 14,  
wherein at the command of an operator the digitised image or images generated  
and added during the last separate action is/are removed from the set.

18. A method according to claim 13 or 14,  
25 wherein the actual number of digitised images in the set is shown on a display  
screen.

19. A method according to claim 13 or 14,  
wherein on each addition of a digitised image to the set an image corresponding  
thereto is printed on an image support by means of the printing unit.

1/9

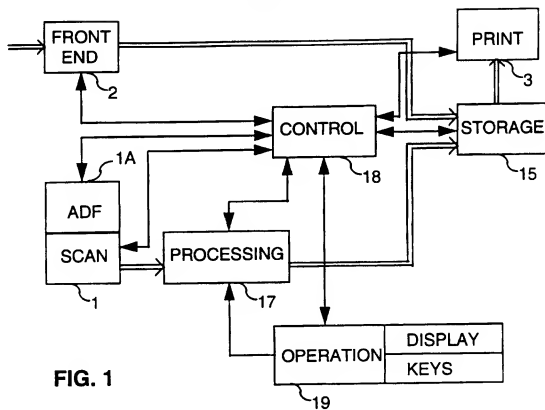


FIG. 6

2/9

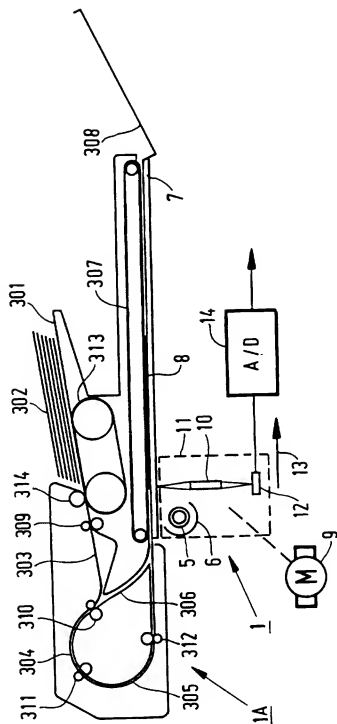


FIG. 2

3/9

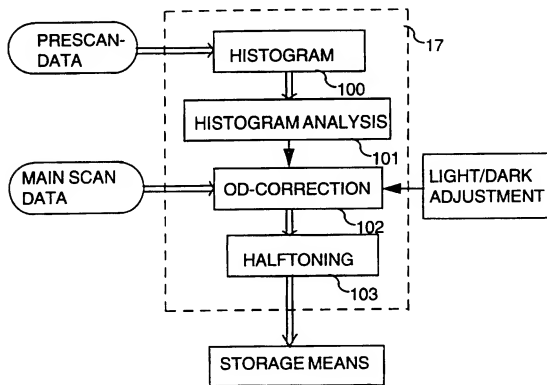


FIG. 3

FIG. 4

4/9

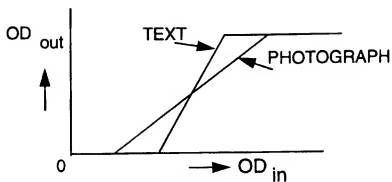


FIG. 5A

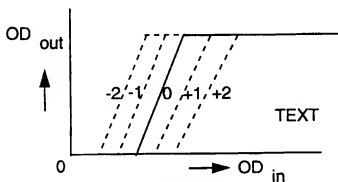


FIG. 5B

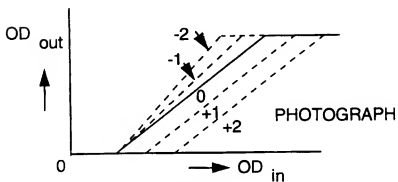


FIG. 5C

5/9

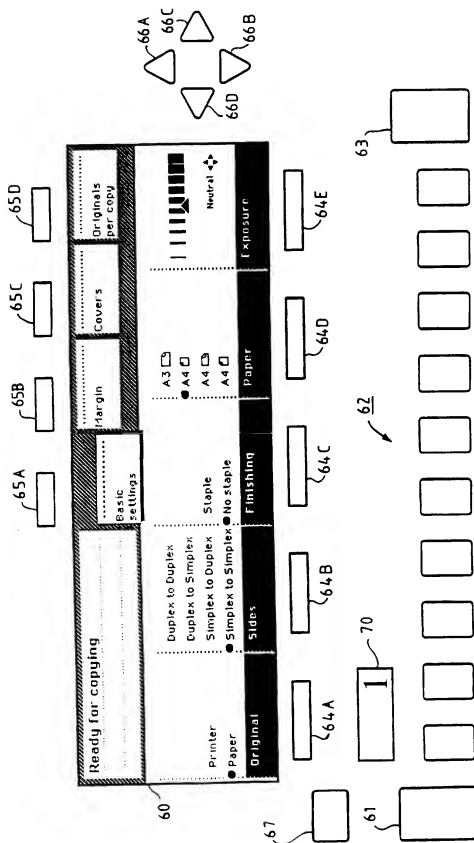


FIG. 7



6/9

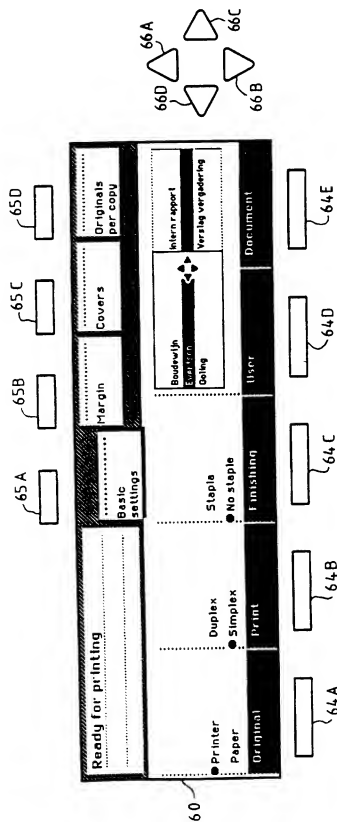


FIG. 8

7/9

FIG. 9A

FIG. 9B

FIG. 9

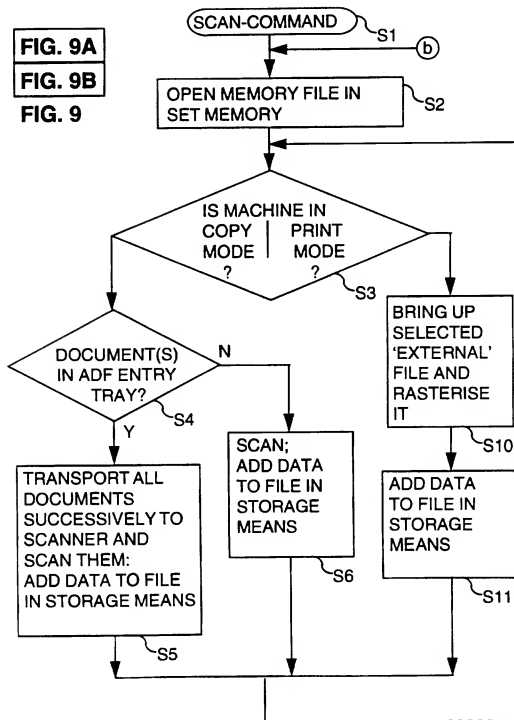


FIG. 9A

8/9

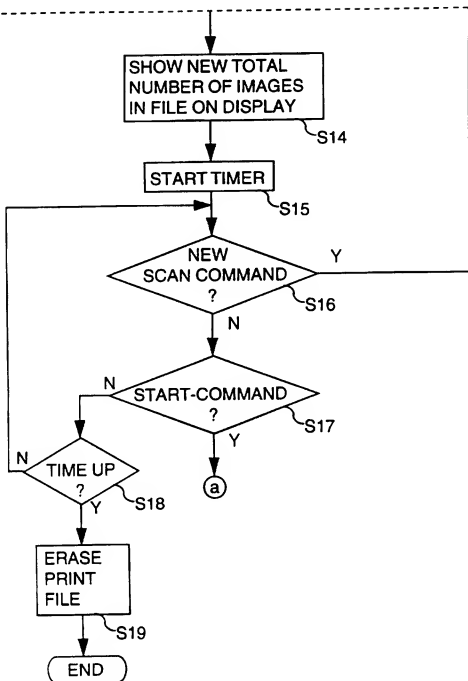


FIG. 9B

9/9

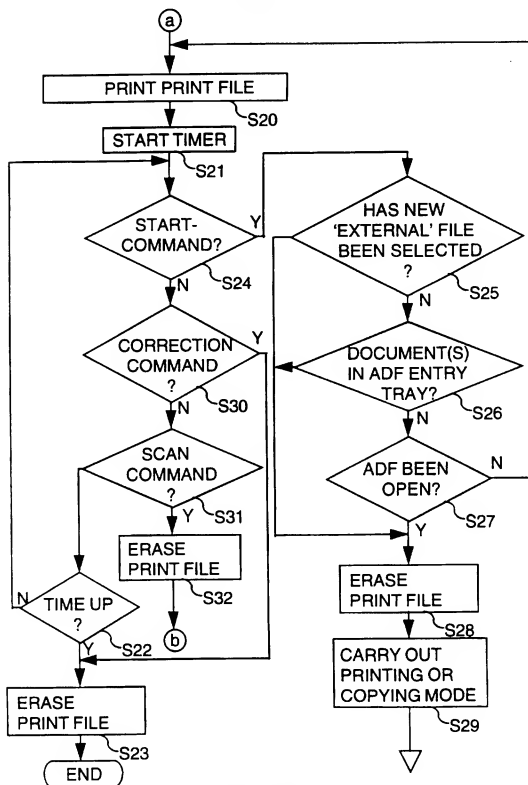


FIG. 10

## INTERNATIONAL SEARCH REPORT

Patent Application No.

PCT/NL 95/00407

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 G06F3/12

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G06F G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE,A,43 13 958 (ROCOH CO. LTD) 4 November 1993 see figures 1-8 see column 6, line 53 - column 10, line 44 ---	1-3,5, 13-16
X	EP,A,0 606 139 (XEROX CORPORATION) 13 July 1994 see figures 2-8 see column 4, line 35 - column 8, line 30 -----	1-3,5,8, 11-17,19



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## \* Special categories of cited documents:

- \* 'A' document defining the general state of the art which is not considered to be of particular relevance
- \* 'E' earlier document but published on or after the international filing date
- \* 'L' document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \* 'O' document referring to an oral disclosure, use, exhibition or other means
- \* 'P' document published prior to the international filing date but later than the priority date claimed

\* 'T' later document published after the international filing date or priority date and not in conflict with the application but cited to underlie the principle or theory underlying the invention

\* 'X' document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\* 'Y' document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\* 'Z' document member of the same patent family

Date of the actual completion of the international search

20 February 1996

Date of mailing of the international search report

28.02.96

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentaan 2  
NL - 2280 HV Rijswijk  
Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,  
Fax (+ 31-70) 340-3016

Authorized officer

Weiss, P

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/NL 95/00407

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A-4313958	04-11-93	US-A- 5325484	28-06-94
		JP-A- 6083827	25-03-94
		US-A- 5375204	20-12-94
		US-A- 5438650	01-08-95
		US-A- 5436627	25-07-95
		US-A- 5446837	29-08-95
		US-A- 5422992	06-06-95
		US-A- 5487165	23-01-96
		US-A- 5483629	09-01-96
		US-A- 5448691	05-09-95
		US-A- 5416896	16-05-95
EP-A-606139	13-07-94	US-A- 5375202	20-12-94
		JP-A- 6274290	30-09-94